

(12) UK Patent Application (19) GB (11) 2 336 121 (13) A

(43) Date of A Publication 13.10.1999

(21) Application No 9908325.5

(22) Date of Filing 12.04.1999

(30) Priority Data

(31) 10099231 (32) 10.04.1998 (33) JP

(71) Applicant(s)

NEC Corporation
(Incorporated in Japan)
7-1 Shiba 5-chome, Minato-ku, Tokyo, Japan

(72) Inventor(s)

Youko Masuta
Mitsuyoshi Uto

(74) Agent and/or Address for Service

Mathys & Squire
100 Grays Inn Road, LONDON, WC1X 8AL
United Kingdom

(51) INT CL⁶

B24B 37/04

(52) UK CL (Edition Q)

B3D DUH2

(56) Documents Cited

GB 1352932 A

(58) Field of Search

UK CL (Edition Q) B3D DMN DMW DUH2
INT CL⁶ B24B 37/04 41/06

(54) Abstract Title

Polishing apparatus.

(57) The apparatus includes a polishing pad, a substrate holder, and a retainer ring. The polishing pad is adhered to a polishing table. The substrate holder urges, while it holds a substrate as a polishing target, a polishing target surface of the substrate against the polishing pad. The retainer ring is formed on a holding surface of the substrate holder to correspond to the circumference of the substrate. The retainer ring has a resin portion formed on its surface which is to come into contact with the polishing pad, and an annular resin holding portion for holding the resin portion and made of a material having a higher mechanical strength than the resin portion.

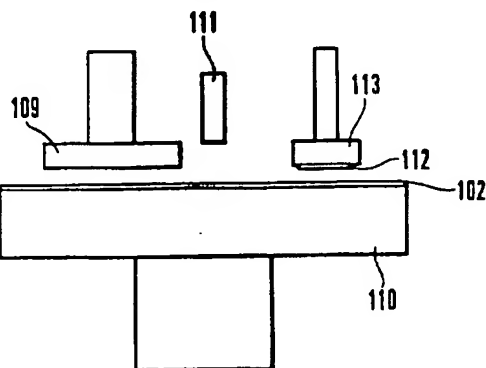


FIG. 1A

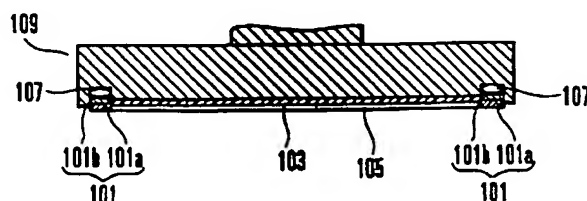


FIG. 1B

GB 2 336 121 A

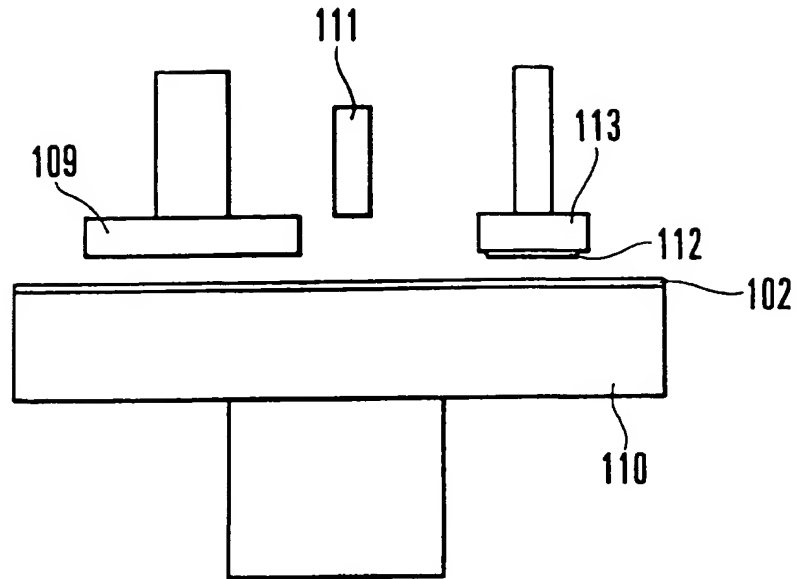


FIG. 1A

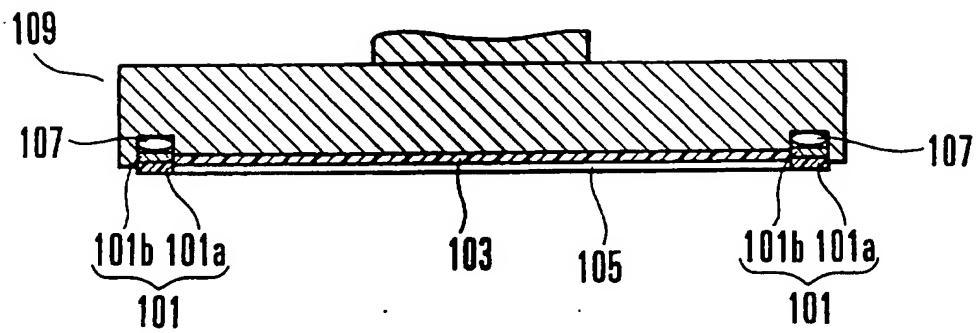


FIG. 1B

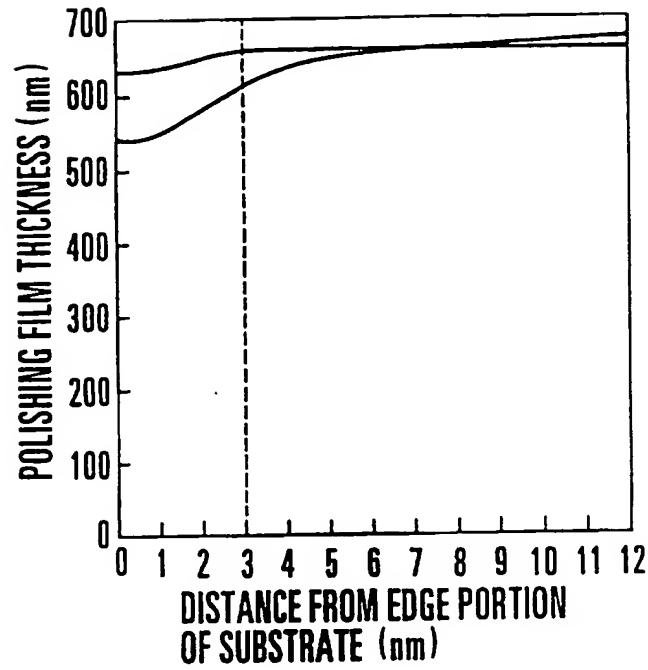


FIG. 2

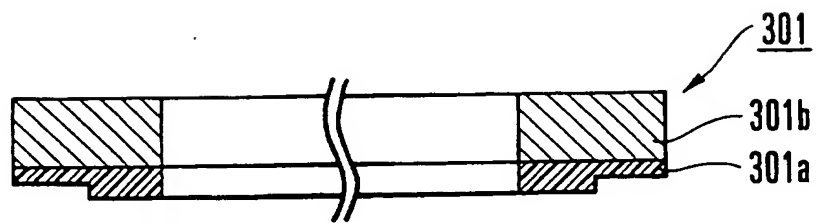


FIG. 3A

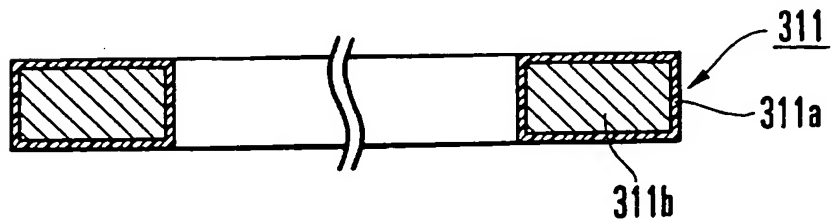


FIG. 3B

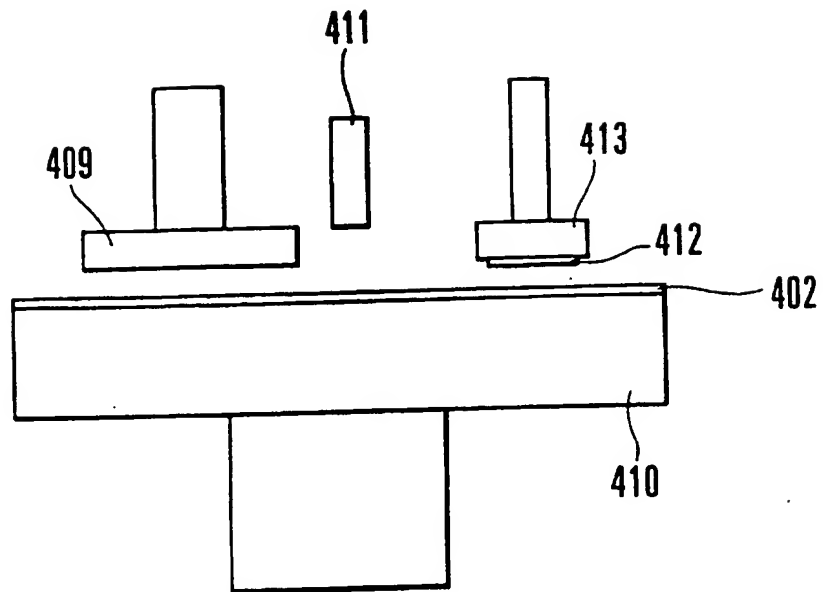


FIG. 4A

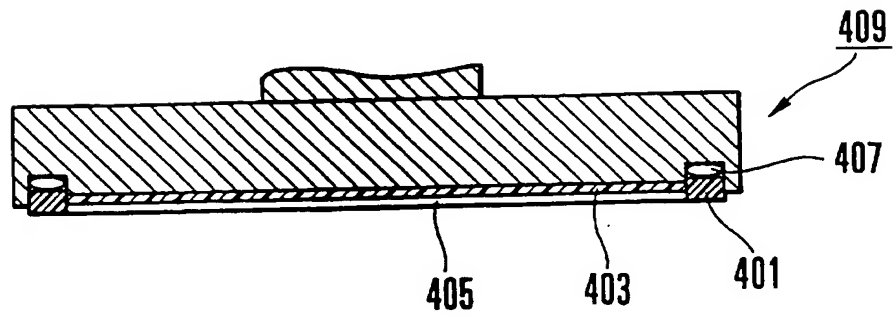


FIG. 4B

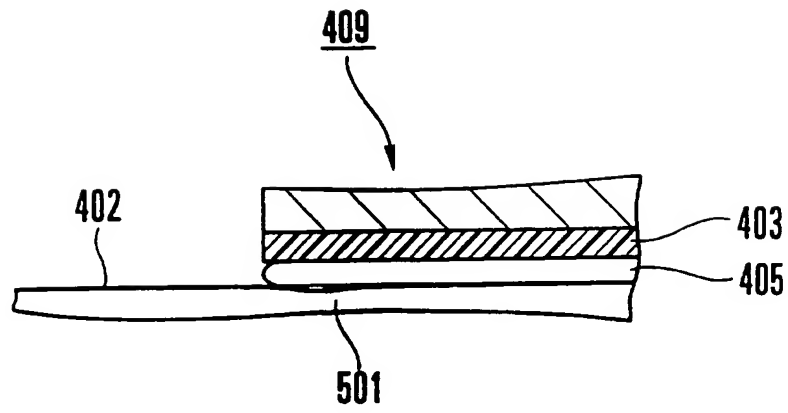


FIG. 5A

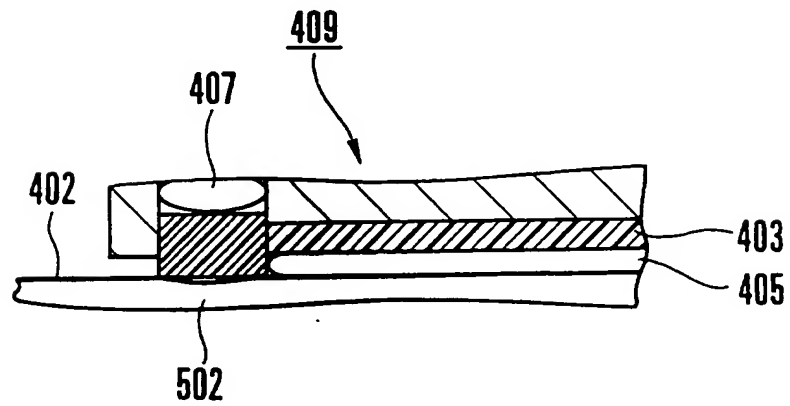


FIG. 5B

Specification

Title of the Invention

Polishing Apparatus

5 Background of the Invention

The present invention relates to a polishing apparatus used in, e.g., chemical-mechanical polishing (CMP).

A technique for planarizing a substrate
10 surface by polishing has been employed in many fields including the semiconductor substrate fabrication process. In recent years, CMP for planarizing the unevenness of a surface, e.g., the unevenness of the surface of an interlevel insulating film, formed during
15 the fabrication by polishing is used in a process of fabricating devices on a semiconductor substrate.

In CMP, hard polishing cloth made of a material such as foamed polyurethane, different from relatively soft polishing cloth comprised of unwoven
20 fabric used for polishing the surface of the semiconductor substrate, is used to planarize the insulating film. To obtain the polishing uniformity within the substrate surface, an elastic cushion layer is generally formed under a hard pad.

25 Figs. 4A and 4B show the arrangement of a conventional polishing apparatus.

As shown in Fig. 4A, the conventional

to suppress deformation, its mechanical strength is limited and inferior to that of a metal alloy material such as stainless steel. Even a conventional retainer ring using a hard plastic deforms when the number of polishing processes increases, and the capability of the retainer to press the polishing pad degrades. As a result, in the conventional polishing apparatus, when the number of polishing processes increases, an abnormality in polishing amount occurs on the outer peripheral portion of the substrate as a polishing target.

Summary of the Invention

It is an object of the present invention to provide a polishing apparatus in which, even if the number of polishing processes increases, occurrence of an abnormality in polishing amount on the outer peripheral portion of the substrate as a polishing target is suppressed.

In a first aspect of the present invention, there is
20 provided polishing apparatus comprising:

a polishing surface;

means for forcing a surface of a sample to be polished against said polishing surface; and



a retainer ring provided on said means for surrounding said substrate, said ring having a resin portion for contacting said polishing surface and holding means for holding said resin portion, said holding means having a higher mechanical strength than said resin portion.

In a second aspect of the present invention, there is provided a polishing apparatus comprising a polishing pad adhered to a polishing table, a substrate holder for urging, while holding a substrate as a polishing target, a polishing target surface of the substrate against the polishing pad, and a retainer ring formed on a holding surface of the substrate holder to correspond to a circumference of the substrate, the retainer ring having a resin portion formed on a surface thereof which is to come into contact with the polishing pad, and an annular resin holding portion for holding the resin portion and made of a material having a higher mechanical strength than the resin portion.

20

Brief Description of the Drawings

Preferred features of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-



metal portion 311b need not be brought into tight contact with each other through an adhesive or the like. As a result, even when the resin portion 311a cannot be adhered to the metal portion 311b depending on combinations of the materials, the retainer ring 311 can be fabricated.

In the above embodiment, stainless steel is used to form the metal portion, and polyethylene terephthalate is used to form the resin portion.

10 However, the present invention is not limited to this, but the following engineering plastics may be used instead. More specifically, examples are polycarbonate, polyamide, polybutylene terephthalate, polysulfone, polyether sulfone, polyether ether ketone, polyamide

15 imide, polyether imide, a chlorotrifluoroethylene-ethylene copolymer, and the like.

The material of the metal portion is not limited to stainless steel, but a metal having a resistance to corrosion and a high mechanical strength, or its alloy may be used.

As has been described above, according to the present invention, since a resin is used to form only a surface of the retainer ring which is to come into contact with the polishing pad, a higher mechanical strength than that obtained when the entire retainer ring is made of only a resin can be obtained. As a result, even when the number of polishing processes



which is to come into contact with the polishing pad,
and an annular resin holding portion for holding the
resin portion and made of a material having a higher
mechanical strength than the resin portion.

1. Polishing apparatus comprising:

means (109) for forcing a surface of a sample to be

a retainer ring (101, 301, 311) provided on said means

for surrounding said **substrate**, said ring having a resin portion (101a, 301a, 301b) for contacting said polishing

surface (102) and holding means (101b, 301a, 301b) for

holding said resin portion, said holding means having a

higher mechanical strength than said resin portion.

2. Apparatus according to Claim 1, comprising a polishing

pad (102) adhered to a polishing table (110).

3. Apparatus according to Claim 1 or 2, wherein said

retainer ring has an internal diameter substantially equal

to the diameter of the sample to be polished.

4. A polishing apparatus characterized by comprising:

a polishing pad (102) adhered to a polishing table

(110);

a substrate holder (109) for urging, while holding a

substrate (105) as a polishing target, a polishing target

surface of the substrate against said polishing pad; and

a retainer ring (101, 301, 311) formed on a holding

surface of said substrate holder to correspond to a

circumference of the substrate, said retainer ring having

a resin portion (101a, 301a, 301b) formed on a surface thereof which is to come into contact with said polishing pad, and an annular resin holding portion (101b, 301a, 301b) for holding said resin portion and made of a material having a higher mechanical strength than said resin portion.

5. An apparatus according to Claim 4, wherein said retainer ring has a two-layered structure formed by stacking said resin portion annularly on a surface of said resin holding portion which opposes said polishing pad.

6. An apparatus according to Claim 4, wherein said retainer ring has a molded structure in which an entire surface of said resin holding portion is covered with said resin portion.

7. An apparatus according to any of Claims 4 to 6, wherein said resin holding portion is formed from one of a metal and an alloy.

8. An apparatus according to Claim 7, wherein said resin holding portion is formed from stainless steel.

9. An apparatus according to any of Claims 4 to 8, wherein said resin portion is formed from a hard plastic.



18

Application No: GB 9908325.5
Claims searched: 1-12

Examiner: R.B. Luck
Date of search: 29 July 1999

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B3D DMN,DMW,DUH2

Int Cl (Ed.6): B24B 37/04,41/06

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB1352932 H.Struers Chemiske Laboratorium	1-4,6,7

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.